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Description of female and early stages of *Hispaniodirphia lemaireiana* (Lepidoptera, Saturniidae) with notes on its ecology

Jiri Hodecek[1,2], Jean Haxaire[3,4], Rodolphe Rougerie[5]

1 *Swiss Human Institute of Forensic Taphonomy, University Centre of Legal Medicine, CH-1000 Lausanne, Switzerland*
2 *Naturéum - Muséum cantonal des Sciences naturelles, Palais de Rumine, Place de la Riponne 6, CH-1014 Lausanne, Switzerland*
3 *Sphingidae Museum of Czech Republic (SMCR), 261 01 Příbram, Czech Republic*
4 *"Le Roc", F-47310 Laplume, France*
5 *Institut de Systématique, Évolution, Biodiversité (ISYEB), UMR 7205 Muséum national d'Histoire naturelle, CNRS, Sorbonne Université, EPHE-PSL, Université des Antilles, Paris, France*

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Corresponding author: Jiri Hodecek (jiri.hodecek@chuv.ch)

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Abstract

Hispaniodirphia lemaireiana Rougerie & Herbin, 2006 is an endemic saturniid moth restricted to the montane pine forests of Hispaniola. Here we provide the first description of the female and the first detailed accounts of the larva (final instar) and pupa. Larvae were observed in Sierra de Bahoruco National Park (Dominican Republic) at 1400–2000 m a.s.l., feeding on the endemic pine *Pinus occidentalis* Sw. Pupae were recovered from the soil beneath host trees, without a cocoon, at depths up to 10 cm. Female variation is documented and compared with *Hispaniodirphia plana* Lemaire, 1999. These data represent the first host-plant association reported for *Hispaniodirphia* and contribute to the biological knowledge of Hemileucinae in Caribbean montane ecosystems.

Key Words

Dominican Republic, Hemileucinae, host plant, immature stages, montane pine forest, *Pinus occidentalis*, Sierra de Bahoruco

Introduction

The genus *Hispaniodirphia* Lemaire, 1999 is the only genus of silkmoths living on Hispaniola, belonging to subfamily Hemileucinae within the Saturniidae family. There are two species belonging to this genus (Lemaire 1999; Rougerie and Herbin 2006): *Hispaniodirphia plana* Lemaire, 1999 and *Hispaniodirphia lemaireiana* Rougerie & Herbin, 2006. Both species are endemic and can be easily distinguished by their wing patterns. Based on current records, *H. lemaireiana* is not uncommon in the mid-elevation forest habitats (1300–2100 m a.s.l.) of the Sierra de Bahoruco National Park on Hispaniola. However, the female and its earlier developmental stages were unknown until now.

In August 2007, Jean Haxaire and Odile Paquit organized an 18-day entomological field trip to the Dominican Republic, focused on a search for Sphingidae. On August 12th, they decided to go up from Pedernales to Los Arroyos, along the border with the Republic of Haiti. This track, which was in very poor condition at the time, allowed them to leave the dry coastal biotopes and climb into the Sierra de Bahoruco, a mountain area wooded mainly with *Pinus occidentalis* Sw. (Fig. 1). This track was not chosen by chance: in 1990, an expedition organized by the Carnegie Museum, bringing together John Rawlins, C. W. Young and S. A. Thomson, collected a fine series of the species *Hispaniodirphia lemaireiana* there, which was later described by Rougerie and Herbin (2006). The objective was to find this beautiful species.

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Figure 1. Landscape view of the pine forest in the National Park Sierra de Bahoruco in 2000 m a.s.l. (photo by Jiri Hodecek).

On the night of the 11th to the 12th, a little beyond Los Arroyos, in the direction of El Aguacate, at 1998 m a.s.l., that species arrived almost without interruption from dusk until 3 a.m., demonstrating its strong presence on the site. Since the dominant plant was *P. occidentalis*, it seemed logical to assume that this was the host plant for this small Saturniidae. On the morning of the 12th, in less than two hours, about twenty pupae had been dug up, found quite easily at the foot of these trees under less than 10 cm of humus and pine needles. These pupae were given to the care of Daniel Herbin but unfortunately none survived and produced adult moths. The interesting point is that now we knew how to obtain females of this species as they did not seem to be attracted to ultraviolet lamps (or maybe have a diurnal flight). The first author of this note was informed of this discovery and decided to try his luck.

In July 2021, June 2023 and May 2024, Jiri Hodecek and Jiri Pirkl conducted entomological expeditions in the Dominican Republic. The main aims of these expeditions were: i) biodiversity research of chosen groups of insects and their habitat preferences; ii) description of new species; and iii) to provide new faunal records for the Dominican Republic. The expeditions were part of a larger project that focused on different insect groups (selected families of Lepidoptera, Coleoptera, Heteroptera, parasitoid wasps, Diptera, Auchenorrhyncha, Dermaptera and Zoraptera). The project had already brought some results (Sartori 2021; Háva and Hodeček 2023; Hodecek et al. 2024; Lingafelter et al. 2024; Barbosa et al. 2025; De Ketelaere and Hodecek 2025; Háva and Hodeček 2025; Hodecek and Haxaire 2025; Mengual et al. 2025; Laguerre and Hodecek 2026).

Materials and methods

Several adults of *Hispaniodirphia lemaireiana* were caught at light traps in two localities in Sierra de Bahoruco National Park at 1400 and 2000 m a.s.l. during all three expeditions. In June 2023, hundreds of caterpillars were observed across the forest in Sierra de Bahoruco National Park (1407 m a.s.l.; 18°08'15"N, 71°32'38"W) feeding on the endemic pine tree, *Pinus occidentalis* Sw. (Fig. 2) and dozens of pupae were collected from under the trees. The adult moths were killed with ethyl acetate and stored in paper envelopes; the pupae were collected and brought to Switzerland to finish their developmental cycle, and the caterpillars were photographed with

Figure 2. A. Caterpillar of *H. lemaireiana* in resting position on a branch of *Pinus occidentalis*; **B.** Dorsal view of the caterpillar (photos by Jiri Hodecek).

Canon EOS 80D + Sigma 150 mm Macro lens. The successful emergence of the first female encouraged the authors to write this article. In May 2024, a single female was attracted by light (small LED HPL) in Sierra de Bahoruco National Park (2000 m a.s.l.; 18°16'18"N, 71°43'31"W). All photographs in this article were taken with Canon EOS 80D + various lenses (Sigma 150 Macro, Canon 18–55, Canon 50 1.8). Measurements are given in millimetres (mm). Terminology for the larval instars follows Lemaire (2002).

Repository abbreviations are as follows:

JHPC Jiri Hodecek private collection, Chemin de Montmoirin 7, Chatel St Denis 1618, Switzerland.

MCSN-VD Muséum Cantonal des Sciences Naturelles (Département Zoologie), Lausanne, Switzerland.

Results

Larva (final instar)

The caterpillars observed on the pine trees were all in their last instar. The description is thus of a caterpillar in what we presume is the 6th instar, since the development of hemileucine moths usually comprises six larval instars (Lemaire 2002).

The final instar larva reaches approximately 60 mm in length and is robust, cylindrical, and heavily ornamented with short spines. The ground color is deep black, densely dotted with small, white, pin-like spots distributed across the entire body. These spots cluster laterally and dorso-laterally to form two continuous white lines along the sides of the body. On abdominal segments A2 to A4, in dorsal view, the spots often coalesce into a more defined transverse white stripe, giving the impression of pale banding across the segments (Fig. 2B). Each segment bears 6–8 short, branched scoli, arranged dorsally and laterally. These scoli are black to dark reddish, tipped with tufts of orange or reddish-brown setae of varying lengths. The general appearance is armored and cryptic, offering camouflage against pine bark and foliage.

The head capsule is rounded and entirely black, with sparse short setae. The spiracles, thoracic legs, and prolegs are reddish to orange, contrasting with the otherwise dark body. The ventral surface is less conspicuously marked but maintains the dark coloration and is covered in shorter setae.

Pupa

The male pupa is 24.6–27.5 mm long and 10–10.6 mm wide, and the female pupa is 28.1–29.6 mm long and 10–11.2 mm wide. The colour is dark red, its surface smooth, but for some very shallow and thin wrinkles over the visible surface of the forewings, as well as shallow striations along the shaft of the antennae (Figs 3, 7C, D). The latter are clearly visible, with their tips joining along the median ventral axis of the pupa; the pectinations are broader in male pupae. Abdominal segments A5 and A6 are circled by an anterior and a posterior sclerotized ridge; segment A4 only bears a posterior ridge, whereas A7 has only the anterior one. The A7–A8 junction is circled by a narrow and shallow striated ring; dorsally, the junctions between segments A1–A2, A2–A3 and A3–A4 are marked with

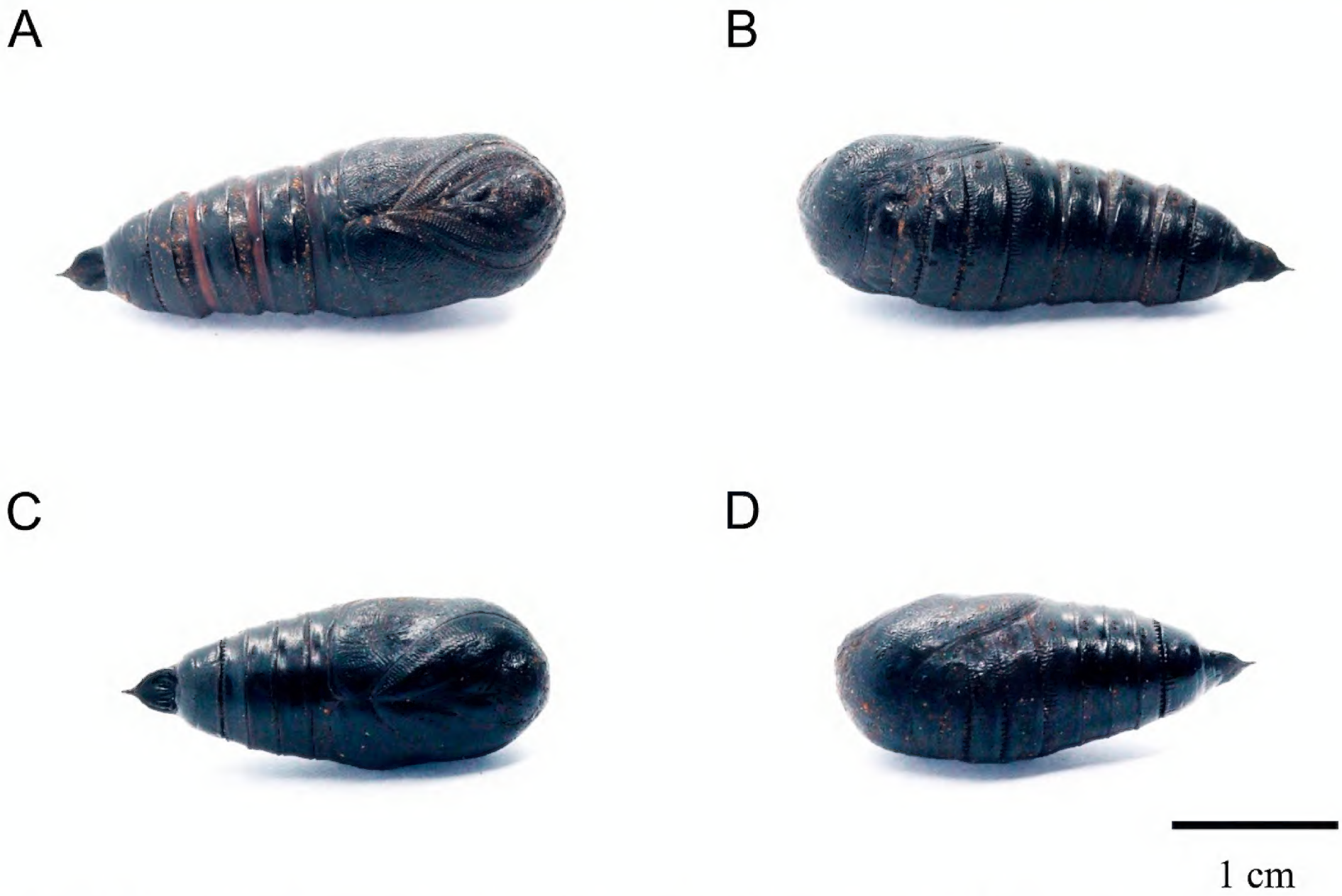

Figure 3. The pupae of *H. lemaireiana*: **A.** Female - dorsal aspect; **B.** Female - ventral aspect; **C.** Male - dorsal aspect; **D.** Male - ventral aspect (photos by Jiri Hodecek).

shallow wrinkles. The spiracles are small and clearly visible on A2 to A8. Segment A10 is drawn into a very strong spine forming a shallow but distinctive cavity on its ventral side (Figs 3, 7C).

Female adult

Material examined. Dominican Republic – Sierra de Bahoruco National Park, 18°08'15"N, 71°32'38"W, 1400 m a.s.l., Jun 2023, 10 females, leg. J. Hodecek, ex pupae. Depository: 6 females in JHPC; 4 females in MCSN-VD.

Forewing length. 30–37.5 mm.

Head and thorax brown with reddish tones, even in the darkest females. The thorax is generally darker than the abdomen but densely covered dorsally with long, erect white hair, a distinctive feature absent in the female of *H. plana* (Fig. 4). The same reddish-brown ground colour continues ventrally, though the thorax is less pilose ventrally, allowing the segmentation and leg insertions to be more clearly visible. Antennae are filiform, slender, and yellowish, with no pectinations.

Forewing (dorsal). Coloration is variable, ranging from orange, reddish, and light brown to dark brown or nearly black (Fig. 5). White scales are scattered throughout the wing surface, as in males (Rougerie and Herbin 2006), though usually less densely (Figs 6A–E, 7A, B). The discal spot is creamy white and elliptical, of variable size and usually present, though rarely faint or reduced (Fig. 5G); it is never yellowish, as observed in *H. plana* (Fig. 4A). The postmedial line is sinuate and formed by a pale band, often accompanied or bordered by a darker brown line; in some individuals, one of these elements may be reduced (Fig. 5C). Overall, the forewing is narrower and pattern less contrasted and sharply defined than in males.

Forewing (ventral). Similar in tone to the upperside but slightly paler, with wing venation more clearly visible in light yellow to ochreous hues. The discal spot remains visible in most specimens, and the postmedial band is fainter and less sharply defined, sometimes appearing as a soft zone of transition between coloured areas.

Hindwing (dorsal). Slightly elongate and more tapered than in males yet retaining the rounded outline. Ground colour ranges from light orange to pinkish brown. The postmedial line appears diffused, with a broad, darker band composed of denser scales. A pale discal spot is present in all observed specimens, including those where forewing markings are faint (Fig. 5G).

Hindwing (ventral). Similar in hue to the upperside but overall paler. A distinct creamy discal spot is present, and the postmedial band forms a weak arc of subtly darker scales. Subterminal pale scaling may form a faint crescent pattern near the margin.

Figure 4. Female of *H. plana* (Carnegie Museum of Natural History): **A.** Dorsal view; **B.** Ventral view; **C.** Labels (photo by Kevin Keagan).

Legs. Covered in short reddish-brown pilosity, matching the thoracic coloration. Forelegs are more robust, while mid- and hindlegs are slender and unarmed. Tibial spines are not prominent, and tarsal segments are unmodified. The ventral insertion areas are cleanly defined and uniformly colored.

Abdomen. Broad and cylindrical, tapering gradually toward the apex. Dorsally, the first segment is lighter, orange-brown in tone, contrasting with the remaining segments. The entire abdomen is banded with alternating reddish-brown and silvery-grey scales, which are especially pronounced on the ventral side (Fig. 5B, D, F). This ventral striping accentuates the segmentation and is consistent across all individuals. The terminal abdominal tuft is rounded, reddish, and densely pilose.

Discussion

The present observations provide both the first description of adult females and the first ecological insights into the life history of *Hispaniodirphia lemaireiana*, an endemic saturniid species restricted to the highlands of Hispaniola. Larvae were repeatedly documented feeding on *Pinus occidentalis*, a pine species endemic to the island and dominant in its high-elevation open forest ecosystems. This host plant association, previously unknown for the genus, suggests a potential evolutionary adaptation to coniferous habitats, which is rare among Hemileucinae, most of which typically utilize broadleaf host plants (but see, e.g., species in the genus *Coloradia* (Tuskes et al. 1996)).

Last instar larvae exhibit strong crypsis and a heavily armored appearance that is likely an anti-predator adaptation to visually hunting avian predators that are common in montane pine forests. The caterpillars do not seem to form groups as they rest separately lengthwise on pine twigs or trunks during daylight hours.

Unlike other members of subfamily Hemileucinae, whose pupae are often enclosed within silken cocoons, *H. lemaireiana* undergoes pupation directly in the soil, without any cocoon. Pupae were recovered at depths ranging from surface level to approximately 10 cm underground, particularly in loose, aerated soil under pine litter. This subterranean strategy may aid in desiccation avoidance and thermal buffering in the relatively dry, open pine forest habitat. No evidence of extended diapause was observed in captivity, suggesting a potentially continuous or seasonally flexible development cycle, although further field data are needed to document voltinism.

These findings contribute not only to the morphological characterization of the species but also to a better understanding of its ecological requirements and life cycle, which are essential information for future conservation considerations, especially considering habitat loss and climatic pressures in Hispaniola's highland ecosystems.

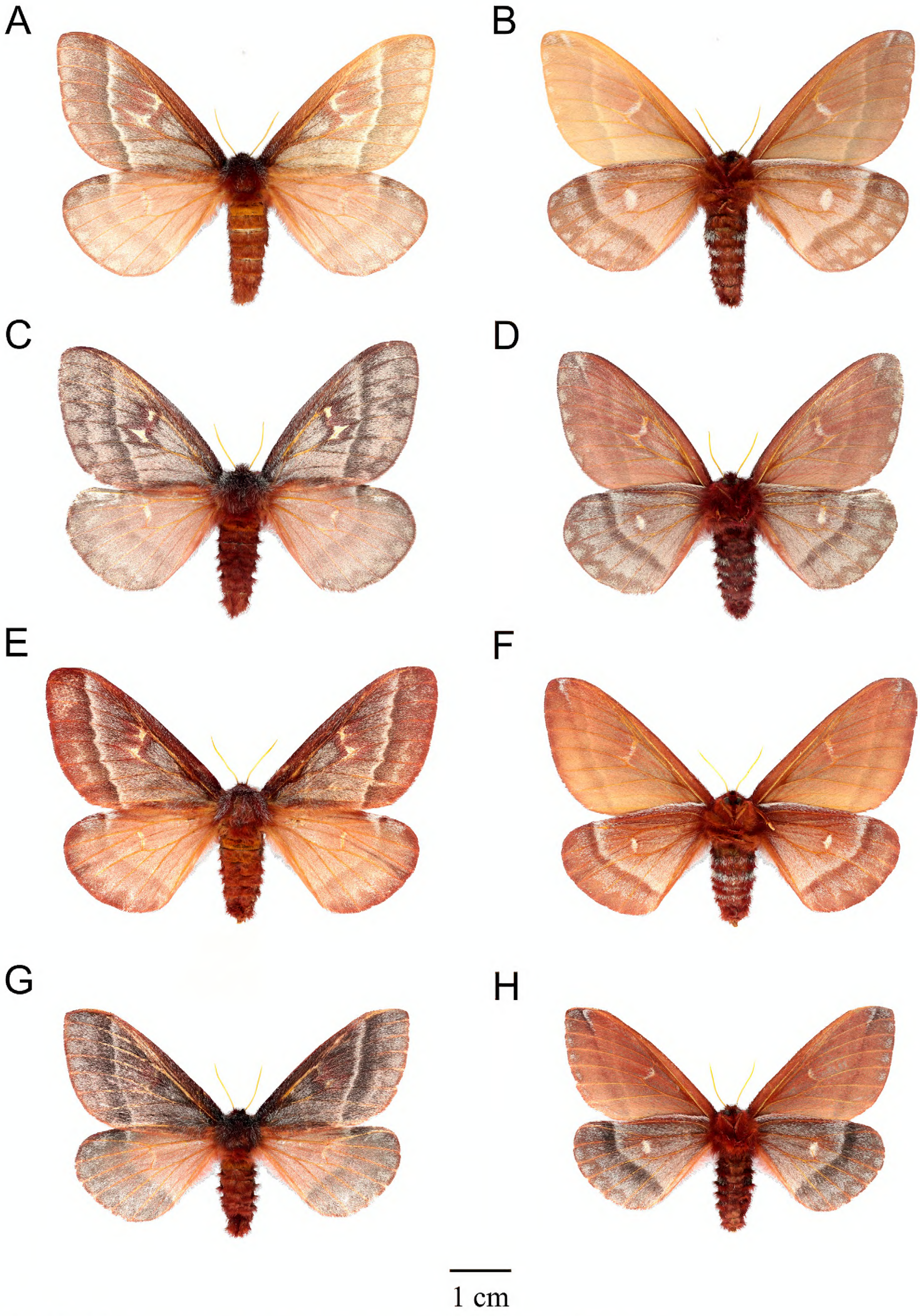

Figure 5. A–H. Variability in females of *H. lemaireiana* (recto/verso) (photos by Jiri Hodecek).

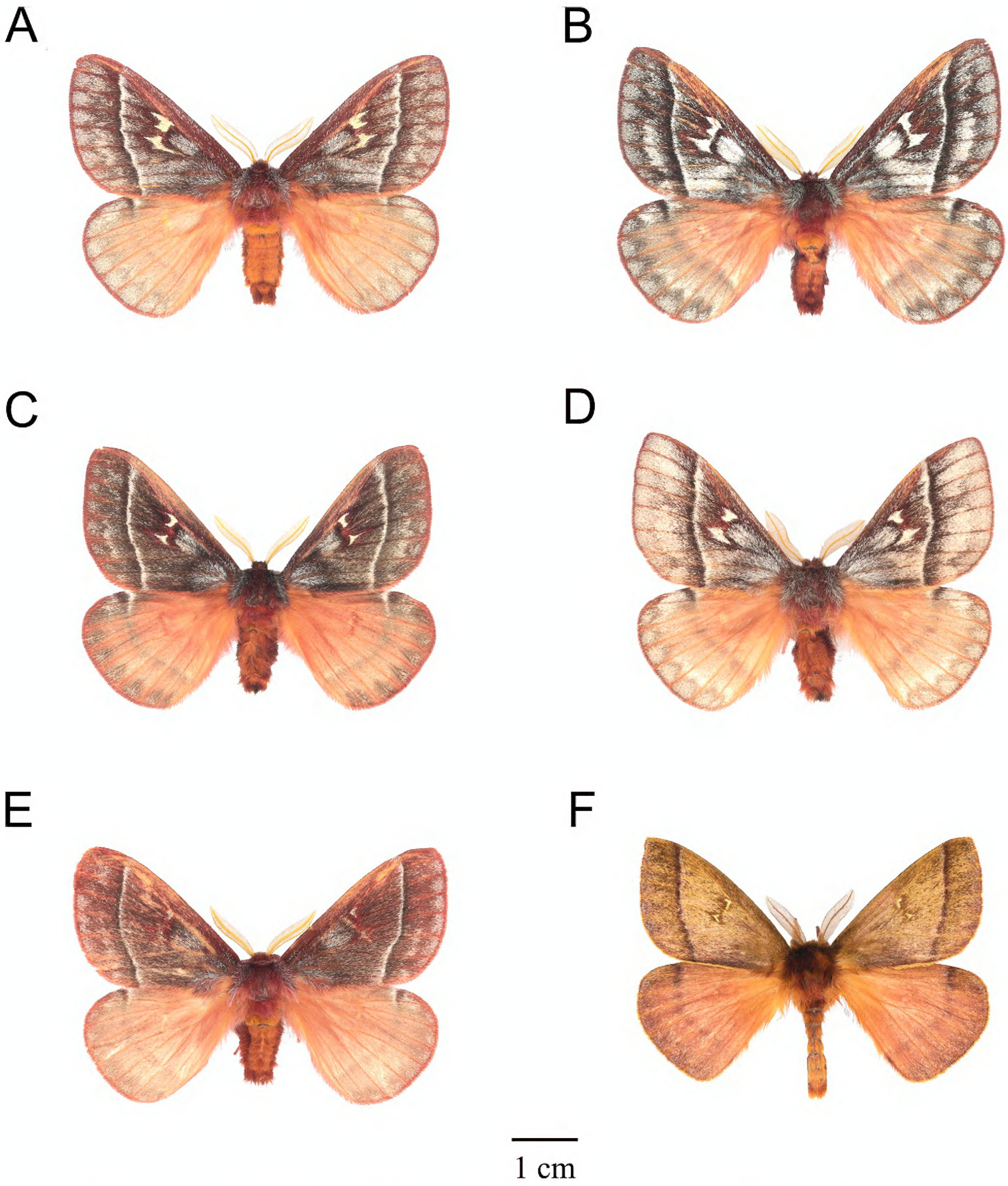

Figure 6. A–E. Variability in males of *H. lemaireiana* (recto); **F.** Male of *H. plana* (recto) (photos by Jiri Hodecek).

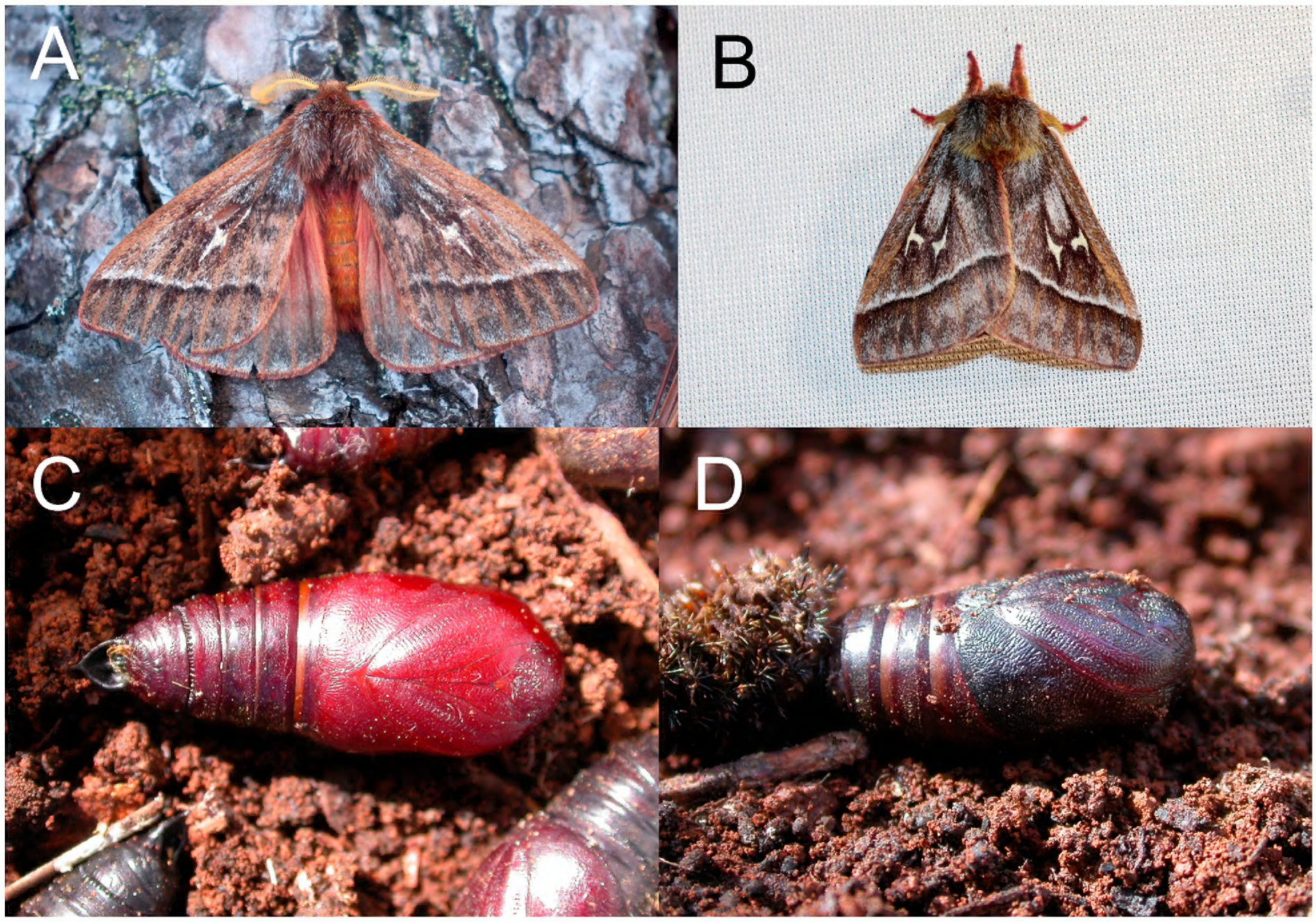

Figure 7. A, B. Live males of *H. lemaireiana*. (photos by Jiri Hodecek); **C, D.** Live pupae of *H. lemaireiana*. (photos by Jean Haxaire).

Conflicts of interest

The authors declare no competing interests.

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